Claims

1. A pump-action nozzle device adapted to be fitted to a container and to enable fluid stored in the interior of said container to be dispensed during use, said device having a body which defines:

(iv) an internal chamber;

(v) an outlet through which fluid dispensed from said chamber is ejected from the device, said outlet further comprising an outlet valve configured to only open and permit fluid to be dispensed from the chamber when the pressure therein exceeds a predetermined minimum threshold pressure; and

(vi) an inlet through which fluid can be drawn into said chamber, said inlet further comprising a valve configured to only open and permit fluid to be drawn into the chamber when the pressure within the chamber falls below the external pressure,

wherein said body comprises a base portion and a housing portion, said base portion and housing portions together defining the internal chamber of the device and being slidably mounted to one another such that said housing portion can be slid towards the base portion to reduce the internal volume of the chamber during a first stage of operation, thereby causing the pressure within the chamber to increase and any fluid stored therein to be dispensed through said outlet to be dispensed if the pressure therein exceeds the predetermined

minimum threshold pressure required to open the outlet valve, and then slid away from the base to increase the volume of the chamber during a second stage of operation, thereby causing the pressure within the chamber to reduce and fluid to be drawn into the chamber through the inlet.

2. A pump-action nozzle device according to claim 1, wherein the base is configured to be fitted to a container.

3. A pump-action nozzle device according to claim 1 or claim 2, wherein the base defines the inlet.

4. A pump-action nozzle device according to any one of the preceding claims, wherein an under surface of the base is configured to be fitted to a container and the upper surface of the base forms an internal surface of the chamber.

5. A pump-action nozzle device according to any one of the preceding claims, wherein the housing forms one or more internal walls of the chamber

6. A pump-action nozzle device according to claims 4 or 5, wherein the housing defines the side wall and an end wall of the chamber and the base defines the opposing end wall.

7. A pump-action nozzle device according to any one of claims 4 to 6, wherein the housing is slidably mounted within a recess formed in an upper surface of the base.

8. A pump-action nozzle device according to any one of the preceding claims, wherein the internal chamber further comprises a plunger.

9. A pump-action nozzle device according to claim 8, wherein the plunger remains stationery while the housing is moved relative to the base.

10. A pump-action nozzle device according to any one of the preceding claims, wherein the plunger forms two seals with the side walls of the chamber, a first of said seals being configured to prevent fluid leaking past the plunger during the first stage of operation and a second of said seals being configured to prevent air leaking into the being drawn into the chamber during the second stage of operation of the device.

11. A pump-action nozzle device according to any one of claims 8 to 10, wherein the plunger is seated on the base.

12. A pump-action nozzle device according to claim 11, wherein the plunger additionally comprises a valve member which is received by a valve seat formed by the base to form said inlet valve.

13. A pump-action nozzle device according to any one of the preceding claims, wherein said nozzle arrangement comprises a resilient means which is resiliently biased to urge said base and said housing apart.

14. A pump-action nozzle device according to claim 13, wherein said resilient means is a spring disposed within the chamber.

15. A pump-action nozzle device according to any one of claims 1 to 7 and 13, wherein fluid present within said internal chamber is contained within a resiliently deformable insert, which is resiliently biased to urge said housing to and said base apart and is configured to be compressed when the volume of the chamber is reduced by sliding the housing towards the base.

16. A pump-action nozzle device according to any one of the preceding claims, wherein cooperating detents provided on the base and the housing abut one another to limit the extent by which the housing may move away from the base.

17. A pump-action nozzle device according to any one of the preceding claims, wherein the outlet comprises an outlet orifice and an internal passageway which connects said chamber to said outlet orifice.

18. A pump-action nozzle device according to claim 17, wherein said outlet valve defined by the body and is disposed within said internal passageway.

19. A pump action nozzle device according to claim 17 or claim 18, wherein at least a portion of the internal passageway is defined between the abutment surfaces of two or more component parts of the body of the nozzle device.

20. A pump action nozzle device according to claim 19, wherein a portion of the internal passageway is also defined by just one of said component parts.

21. A pump action nozzle device according to claim 20, wherein said outlet valve is formed on said part and disposed within said portion.

22. A pump action nozzle device according to any one of claims 17 to 20, wherein the valve is disposed in the at least a portion of the internal passageway that is defined between the abutment surfaces of the two or more component parts of the body.

23. A pump action nozzle device according to claim 22, wherein a valve member of the outlet valve is formed on one of said parts, said valve member being resiliently biased to assume a position in which the internal passageway is closed and being further configured to only be displaced from said resiliently biased position to define an open channel through which fluid can flow when the pressure within the chamber exceeds a predetermined minimum threshold pressure.

24. A pump action nozzle device according to any one of claims 17 to 23, wherein each of said parts has an abutment surface which contacts the abutment surfaces of the other parts when the parts are contacted together in the assembled nozzle device, at least one of said abutment surfaces having one or more groove and/or recesses formed thereon which define said internal passageway between the abutment surfaces when said parts are contacted together.

25. A pump action nozzle device according to any one of claims the preceding claims, wherein said outlet is defined by the housing portion of the body.

26. A pump-action nozzle arrangement according to any one of the preceding claims, wherein said housing further comprises two component parts.

27. A pump-action nozzle arrangement according to claim 26, wherein at least a portion of said passageway is defined between two component parts of the housing portion of said body.

28. A pump action nozzle device according to claim 26 or claim 27, wherein said housing comprises a first component part that defines said chamber together with said base and a second component part which is fitted to said first part to such that abutment surfaces of said first and second parts are contacted together to define at least a portion of the internal passageway.

29. A pump action nozzle device according to any one of claims 17 to 24 and 27 to 28, wherein the outlet orifice is formed at an edge of the abutment surfaces of the two or more component parts.

30. A pump action nozzle device according to any one of claims 17 to 24 and 27 to 29, wherein said internal passageway further comprises one or more internal spray-modifying features.

31. A pump action nozzle arrangement according to any one of claims 1 to 30, wherein said nozzle arrangement is configured to receive an insert comprising one or more spray modifying features, said insert being configured such that fluid exiting the outlet orifice flows into said insert, through the one or more spray modifying features, and is ejected through an outlet of the insert.

32. A pump action nozzle arrangement according to claims 30 or 31, wherein said spray-modifying features include one or more features selected from the group consisting of: an expansion chamber, a swirl chamber, an internal orifice, multiple passageway branches, a dog-leg arrangement, a venturi chamber, an outlet orifice in the form of a slit, or multiple outlet orifices.

33. A pump action nozzle arrangement according to any one of the preceding claims, wherein said device further comprises an air leak valve configured to enable air from the external environment to access the interior of the container to equalise any pressure differential that exists between them.

34. A pump action nozzle arrangement according to any one of the preceding claims, wherein said chamber is divided into two compartments, a first of said compartments comprising the inlet valve and the outlet valve and being configured dispense fluid drawn in through the inlet of the device during the first and second stages of operation, and a second of said compartments being a separate an air compartment configured to a eject a stream of air through the nozzle outlet during the first stage of operation and draw air in from the outside during a second stage of operation.

35. A pump action nozzle arrangement according to claim 34, wherein said air chamber is provided with an outlet valve configured to only open and permit a stream air to flow through the outlet of the nozzle arrangement when the pressure within the air compartment exceeds a predetermined minimum pressure.

36. A pump action nozzle arrangement according to claims 17 to 24 in combination with claim 34 or 35, wherein said air stream is introduced into said internal passageway at any position along its length through an outlet channel of the air compartment.

37. A pump action nozzle arrangement according to any one of claims 34 to 36, wherein said air compartment further comprises an air inlet valve.

38. A pump action nozzle arrangement according to any one of the preceding claims, wherein said device further comprises a trigger actuator configured such that when said trigger is pulled, said housing is caused to slide towards said base in said first stage of operation.

39. A trigger actuator adapted to be fitted to a pump-action nozzle device as defined in any one of claims 1 to 17, said trigger actuator comprising a trigger and means by which the trigger actuator may be connected to the base and the housing, wherein said trigger actuator is configured so that when the trigger is pulled said housing is caused to move relative to the base and compress the chamber during the first stage of operation and when said trigger is released said housing can move relative to the base to expand the chamber during the first stage of operation.

40. A trigger actuator according to claim 39, wherein said trigger actuator is connected to the base of the nozzle device by a first attachment element and the housing by a second attachment element, said elements being moveable

towards each other when the trigger is pulled and moveable apart from each other when the trigger is returned to its original position.

41. A pump action nozzle device adapted to be fitted to an opening of a container and enable a liquid to be dispensed from the interior of said container, said nozzle device having a body which defines an internal chamber and which comprises:

(i) an inlet having a one-way valve through which fluid can be drawn into said chamber;

(ii) an outlet orifice;

(iii) an internal passageway that connects said chamber to said outlet orifice;

(iv) a one-way outlet valve disposed in said internal passageway and adapted to only open and permit fluid to flow along said passageway when the pressure within the internal chamber exceeds a predetermined minimum pressure; and

(iv) an actuator;

wherein said body is configured such that the internal volume of the chamber is reduced when said actuator is operated, thereby causing fluid stored in the chamber to be ejected through said outlet valve and along said internal

passageway to the outlet orifice, and increased when said actuator is released, thereby causing fluid to be drawn into the chamber through the inlet;

characterised in that said body further defines an air chamber configured to dispense a stream of air into said internal passageway or said outlet orifice when said actuator is operated through an outlet channel which connects said air chamber to a position along said internal passageway or said outlet, said body being configured such that the internal volume of the chamber is reduced when said actuator is operated, thereby causing air present in the air chamber to be ejected through said outlet channel and into said internal passageway or said outlet orifice, and increased when said actuator is released, thereby causing air to be drawn into the air chamber.

42. A pump-action nozzle device according to claim 41, wherein the device comprises a resilient means configured to cause the volume of the chamber to increase once the actuator is released.

43. A pump-action nozzle device according to claim 41 or claim 42, wherein the body of the device comprises two component parts that can be moved towards one another to compress both the internal chamber and the air chamber and away from one another to cause both the internal chamber and the air chamber to expand.

44. A pump-action nozzle device according to claim 43, wherein the resilient means is biased against both of said parts to urge the two parts away from one another and said chamber is compressed by applying a pressure against the action of said resilient means.

45. A pump-action nozzle device according to claim 44, wherein the resilient means is a spring or a resiliently deformable insert provided in one or both said internal chamber and said air chamber.

46. A pump-action nozzle device according to any one or claims 41 to 45, wherein air is drawn into the air chamber through outlet orifice, internal passageway and outlet channel when the actuator is released and the volume of said chamber is caused to increase/expand.

47. A pump-action nozzle device according to any one of claims 41 to 45, wherein the device further comprises an air inlet through which air is drawn into the air chamber from outside the device.

48. A pump-action nozzle device according to claims 47, wherein the air inlet comprises an air inlet valve configured to only open and permit air to be

drawn into the air chamber when the pressure therein falls below the external pressure.

49. A pump-action nozzle device according to any one of claims 41 to 48, wherein air is introduced into the internal passageway at a position which is downstream from the outlet valve.

50. A pump-action nozzle device according to any one of claims 41 to 49, wherein the outlet channel is one or more fine holes or pores which permit air to flow through but prevent liquid from the internal chamber accessing the air chamber.

51. A pump-action nozzle device according to any one of claims 41 to 49, wherein the outlet channel comprises an air release valve adapted to only open and permit fluid to flow along said passageway when the pressure within the air chamber exceeds a predetermined minimum threshold pressure.

52. A pump-action nozzle device according to claim 46 in combination with claim 51, wherein the air release valve is a two-way valve configured to permit air to flow (i) out of the air chamber when the pressure within the chamber exceeds a predetermined minimum pressure, and (ii) into the air chamber when the pressure therein is below the external pressure.

53. A pump-action nozzle device according to any one of claims 47, 48, 51 and 52, wherein the air release valve is a one way valve configured to only open and permit air to flow out of the air chamber when the pressure therein exceeds a predetermined minimum and prevent flow in the opposite direction.

54. A pump-action nozzle device according to any one of claims 51 to 53, wherein the outlet valve and the air release valve are configured to open when substantially the same minimum threshold pressure.

55. A pump-action nozzle device according to any one of claims 41 to 55, wherein the internal passageway is separated from said air chamber by a wall of the body and said outlet channel is formed in said wall at any desired position so that air can be ejected into said internal passageway to any desired position along the length of the internal passageway.

55. A pump-action nozzle device according to claims 55, wherein the chamber is positioned either above or below the internal passageway and said outlet channel is formed in an upper or lower wall of the chamber respectively.

56. A pump-action nozzle device according to any one of claims 41 to 55, wherein at least a portion of the internal passageway of the outlet is defined between the abutment surfaces of two or more component parts of the nozzle device.

57. A pump-action nozzle device according to claim 56, wherein a portion of the internal passageway may be defined by just one of said component parts.

58. A pump-action nozzle device according to claims 56 or 57, wherein each of said parts has an abutment surface which contacts the abutment surfaces of the other parts when the respective component parts are contacted together in the assembled nozzle device and at least one of said abutment surfaces has one or more groove and/or recesses formed thereon which define said internal passageway between the abutment surfaces when said parts are contacted together.

59. A pump-action nozzle device according to claim 58, wherein the at least a portion of the internal passageway is defined between two component parts of said body.

60. A pump-action nozzle device according to claim 59, wherein the at least a portion of the passageway is defined between opposing abutment surfaces of

said two parts and at least one of said abutment surfaces having one or more grooves and/or recesses formed thereon which define said passageway when the abutment surfaces of said parts are contacted together.

61. A pump-action nozzle device according to any one of claims 41 to 60, wherein the outlet valve is formed by the body of the nozzle arrangement.

62. A pump-action nozzle device according to claim 61, wherein at least a portion of the internal passageway is defined between the abutment surfaces of two or more parts of the nozzle device and the outlet valve is formed within said portion of the internal passageway.

63. A pump-action nozzle device according to claim 62, wherein the outlet valve comprises a valve member that is formed on one of the component parts, said valve member being resiliently biased against the opposing surface of the other component part or parts, thereby closing the internal passageway formed there between, and being configured to be displaced so as to define an open channel through which fluid can flow when the pressure within the chamber exceeds a predetermined minimum threshold pressure.

64. A pump action nozzle device according to any one of claims 41 to 63, wherein said internal passageway further comprises one or more internal spray-modifying features.

65. A pump action nozzle arrangement according to any one of claims 41 to 63, wherein said nozzle arrangement is configured to receive an insert comprising one or more spray modifying features, said insert being configured such that fluid exiting the outlet orifice flows into said insert, through the one or more spray modifying features, and is ejected through an outlet of the insert.

66. A pump action nozzle arrangement according to claims 64 or 65, wherein said spray-modifying features include one or more features selected from the group consisting of: an expansion chamber, a swirl chamber, an internal orifice, multiple passageway branches, a dog-leg arrangement, a venturi chamber, an outlet orifice in the form of a slit, or multiple outlet orifices.

67. A pump action nozzle arrangement according to any one of claims 64 to 66, wherein said outlet channel is arranged so that air from the air chamber is introduced into a chamber formed in the internal passageway.

68. A pump action nozzle arrangement according to any one of claims 41 to 67, wherein said device further comprises an air leak valve configured to enable air from the external environment to access the interior of the container to equalise any pressure differential that exists between them.

69. A container comprising a pump-action nozzle arrangement as defined in any one of claims 1 to 40 fitted thereto.

70. A container comprising a pump-action nozzle arrangement as defined in any one of claims 41 to 68 fitted thereto.